

COASTAL CHIP: A CHIPPING POTATO VARIETY RESISTANT TO HEAT STRESS

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Abstract

Coastal Chip is a medium-late maturing potato chipping variety suitable for production in locations along the east coast of the United States where heat stress reduces internal quality of tubers. It yields as well as the variety Atlantic but is not as susceptible to heat necrosis. The specific gravity of Coastal Chip averages approximately 0.010 less than Atlantic at locations subject to heat stress. In the seed producing areas of Maine it's specific gravity averages approximately 0.005 less than that of Atlantic. Tubers are round, netted-skinned, and have moderately deep stem and bud ends. Chips from Coastal Chip are slightly lighter in color than those produced by Atlantic. In mid-Atlantic states where heat stress adversely affects chip color Coastal Chip processes into chips for a slightly longer period of time after harvest than does Atlantic. Glycoalkaloid content of Coastal Chip averaged 7.9 mg/100 g fresh tissue. Sunburned (green) tubers of Coastal Chip develop

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purple streaks that remain following processing. Hills must be properly covered to reduce losses. Coastal Chip is resistant to race A of the golden nematode (*Globodera rostochiensis*) and potato virus A. It is tolerant to Verticillium wilt, more susceptible to common scab and Rhizoctonia than Atlantic and susceptible to potato virus X.

Compendio

Coastal Chip es una variedad de papa de maduración semitardía, de buena calidad para fritura a la inglesa, apropiada para ser producida en lugares de la costa oriental de los Estados Unidos donde el estrés por calor reduce la calidad interna de los tubérculos. Rinde tanto como la variedad Atlantic, pero no es susceptible a la necrosis por calor. La gravedad específica de Coastal Chip promedia aproximadamente 0,010 menos que la de Atlantic en los lugares expuestos al estrés por calor. En las zonas productoras de semilla en Maine su gravedad específica promedia aproximadamente 0,005 menos que la de Atlantic. Sus tubérculos son redondos, con piel reticulada y tienen extremos basales y apicales moderadamente deprimidos. Las papas fritas de Coastal Chip son de color ligeramente más claro que aquellas producidas con Atlantic. En los estados centrales del Atlántico donde el estrés por calor afecta severamente el color de las papas fritas a la inglesa, el procesamiento de Coastal Chip, después de la cosecha, toma un tiempo ligeramente mayor de aquel registrado para Atlantic. El contenido de glicoalcaloides de Coastal Chip promedia 7,9 mg/100 g de tejido fresco. El verdeo de los tubérculos de Coastal Chip expuestos al sol desarrolla estrías de color púrpura que permanecen aún después del procesamiento. Los montículos de papa deben ser cubiertos adecuadamente para reducir las pérdidas. Coastal Chip es resistente a la raza A del nematodo dorado (*Globodera rostochiensis*) y al virus A de la papa. Es tolerante a la marchitez por *Verticillium*, más susceptible a la sarna común y a *Rhizoctonia* que Atlantic y susceptible al virus X de la papa.

Introduction

Coastal Chip, a new netted-skinned potato variety for production areas on the east coast where heat stress reduces internal quality of tubers, was released on May 11, 1990, by the Agricultural Research Service, U.S. Department of Agriculture, and the Agricultural Experiment Stations of Virginia, New York, Pennsylvania, New Jersey, and Maine, and the North Carolina Agricultural Research Service. Coastal Chip is suitable for chipping from the field and for up to three months from storage at 10 C. Coastal Chip was evaluated under the pedigree B9792-157. It was selected in 1979 by R.E. Webb from the progeny of a cross of Wauseon x B5141-6. The female parent, Wauseon (3), was selected because of its high yields of smooth, creamy-white tubers and its resistance to common scab, latent and mild

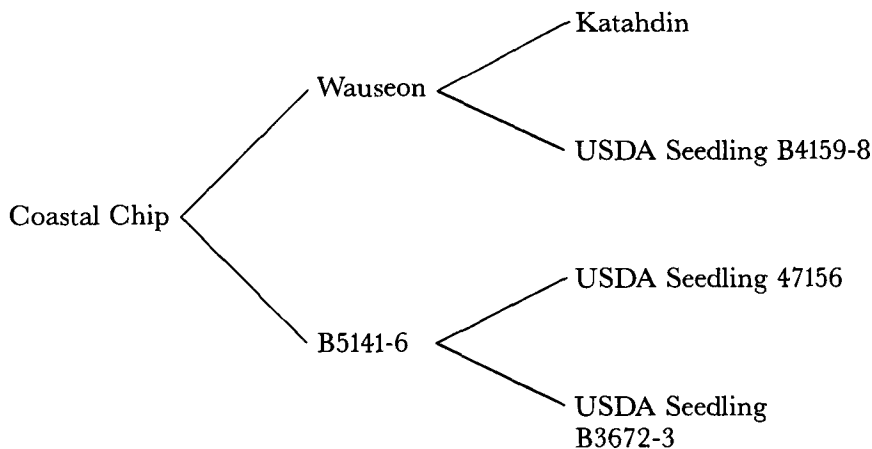
mosaics, and race A of the golden nematode (*Globodera rostochiensis*). The male parent, B5141-6 (1) was selected because of its high solids content and chipping quality.

Coastal Chip is a full-sibling to the highly successful variety Atlantic. In areas where heat necrosis in Atlantic is a severe problem, Coastal Chip has shown little, if any, heat necrosis, making it suitable for production in the mid-Atlantic areas where heat stress during the growing season may lead to internal necrosis of tubers. However, it is as susceptible to hollow heart as Atlantic. To reduce the incidence of internal purple discoloration that may occur on sunburned tubers, this variety requires adequate hilling.

Coastal Chip is of medium-late maturity and has a medium-sized vine. Its netted tubers are round or oblong with deep stem ends. Under heat and drought stress conditions, it is less subject to growth cracks and knobiness than Atlantic, Norchip, or Monona. It is resistant to race A of the golden nematode and potato virus A. It is tolerant to *Verticillium* wilt. Coastal Chip is more susceptible to scab and *Rhizoctonia* than Atlantic, and is susceptible to potato virus X. It yields approximately the same as Atlantic under heat stress conditions and produces lighter colored potato chips. However, its specific gravity is usually lower than in Atlantic by approximately 0.010. Glycoalkaloid content of Coastal Chip averaged 7.9 mg/100 g fresh tissue, as compared to 3.7 mg/100 g fresh tissue for Monona grown in Maine in 1987.

The name Coastal Chip was selected because of the clone's adaptation to the mid-Atlantic States. Only preliminary trials have been conducted outside the Northeast.

The pedigree of Coastal Chip is as follows:



The breeding and seedling tuber production of Coastal Chip were carried out at the Beltsville Agricultural Research Center, Beltsville, MD. Initial

clonal selection, seed increases and preliminary horticultural evaluations were done on the Chapman Experimental Farm, Presque Isle, Maine. Yield and disease were evaluated at the Aroostook and Echo Lake Farms, Presque Isle, Maine, and at Beltsville, Maryland. Golden nematode resistance was determined by B.B. Brodie using the techniques described by Brodie and Plaisted (2). Preliminary evaluations with cooperators in Virginia, New York, Pennsylvania, New Jersey and North Carolina began in 1982, inter-regional performance trials along the east coast through NE-107 began in 1986, and grower trials began in 1987.

Description

PLANTS: Medium to medium-late maturing, medium size. Stems: moderate pigmentation with little pigmentation in new growth. Wings: Slightly waved, small, not prominent. Nodes: slightly swollen. Stipules: medium size. Leaves: medium to dark green, slightly pubescent, closed. Terminal leaflet: medium size, asymmetrical, lobed, length 105.0 ± 10.5 mm, width 71.0 ± 8.3 mm, index 67.6. Primary leaflets: medium size, partly truncated, asymmetrical, three pairs, length 99.3 ± 11.9 mm, width 59.6 ± 7.7 mm, index 60.0. Secondary leaflets: numerous, prominent. Tertiary leaflets: moderate in number, small. Midrib: medium green, slightly pubescent. Petioles: medium green, slightly pubescent.

FLOWERS: Moderate in number, white. Buds: greenish cream color. Calyx: 10 mm, triangular, light green, pubescent, curled. Corolla: cream to white, 16 mm, as they mature the lobes fold back. Anthers: yellow. Fertility: high, as both a pistillate and staminate parent, based on production of numerous seed balls.

TUBERS: Round, oblong, blocky, mean width 76.7 ± 5.4 mm, mean depth 63.7 ± 5.0 mm, mean length 79.6 ± 7.2 mm, moderately deep stem and bud ends. Indices: width to length, 96.4; depth to length, 80.0; width to depth, 120.4. Skin: netted. Eyes: shallow, well distributed over tuber. Flesh: creamy-white. Dormancy: medium-short, long sprouts after three months storage at 10 C. Maturity: medium to medium-late.

DISEASE RESISTANCE: Coastal Chip is resistant to race A of the golden nematode (*Globodera rostochiensis*) and potato virus A. Based on disease screening trials conducted on Aroostook State Farm, Presque Isle, Maine, it is tolerant to Verticillium wilt and more susceptible to scab and Rhizoctonia than Atlantic and susceptible to potato virus X.

ELECTROPHORETIC PATTERNS¹: Tuber tissue from Coastal Chip was assayed to construct an electrophoretic fingerprint according to

¹Information on the electrophoretic pattern supplied by Dr. David S. Douches, Department of Crop and Soil Sciences, Michigan State University, East Lansing, Michigan.

the procedures of Douches and Ludlam (4). Eleven isozyme loci are described below:

Mdh-	1 ² 1 ² 1 ³ 1 ⁴	Mdh-	2 ² 2 ² 2 ² 2 ²
6-Pgdh-	3 ¹ 3 ¹ 3 ² 3 ²	Pgi-	1 ² 1 ² 1 ² 1 ²
Idh-	1 ¹ 1 ¹ 1 ¹ 1 ²	Got-	1 ³ 1 ³ 1 ⁴ 1 ⁴
Got-	2 ³ 2 ⁵ 2 ⁵ 2 ⁵	Pgm-	1 ¹ 1 ¹ 1 ¹ 1 ³
Pgm-	2 ² 2 ² 2 ² 2 ³	Aps-	1 ¹ 1 ¹ 1 ² 1 ²
Prx-	3 ¹ 3 ² 3 ² 3 ³		

Characteristics

Coastal Chip was evaluated for yield, specific gravity, and chipping quality from 1987 to 1989 in replicated trials in Maine, New York, Pennsylvania, New Jersey, Virginia, and North Carolina through the Northeast Regional Project, NE-107 (Table 1). The marketable yield of Coastal Chip was similar to that of the variety Atlantic at all locations. The specific gravity of Coastal Chip was lower than that of Atlantic. However, in most trials Coastal Chip chipped out of the field with acceptable chip color for a longer period of time than Atlantic. Coastal Chip also produced lighter color chips than Atlantic after 10 C storage for 3 to 4 months. Chips produced from 4 C storage were of an unacceptably dark color. However, after three months of 4 C storage, potatoes reconditioned at 21 C for three weeks produced chips with acceptable chip color.

Coastal Chip is as susceptible to hollow heart as Atlantic. Therefore, production of oversized tubers that might have hollow heart can be minimized through moderate fertilization, close spacing of seed pieces, proper timing of irrigation, and killing of vines when tubers have grown to the desired size.

Seed of Coastal Chip is available from seed growers listed in the Maine Seed Potato Certification Directory. A copy of this directory is available from Terry L. Bourgoign, Director, Division of Plant Industry, State House Station 28, Augusta, Maine 04333.

TABLE 1.—Results from NE-107 Regional Trials for Coastal Chip compared with Atlantic, 1987-1989.

Location ¹	Variety	Total Marketable Yield		Specific Gravity	Chip Color	
		Year	T/ha		Comments ²	
Virginia	Atlantic	1989	25.8	22.2	1.066	1,4,6 Chipped 1,8,13 days after harvest (DAH), respectively.
	Coastal Chip	1989	31.4	27.1	1.063	1,1,3 1-4 acceptable.
	Atlantic	1988	50.9	44.0	1.089	2,4,6 Chipped 2,7,10 DAH, respectively.
	Coastal Chip	1988	51.2	43.5	1.079	3,5,6 1-4 acceptable.
	Atlantic	1987	27.7	25.1	1.071	1,6,8 Chipped 2,6,8 DAH, respectively.
	Coastal Chip	1987	31.5	25.1	1.062	2,5,6 1-4 acceptable.
New York	Atlantic	1989	41.8	38.2	1.097	36 Chipped mid-January out of 10 C, Agron
	Coastal Chip	1989	43.8	38.9	1.090	40 M600 colorimeter; readings >40 acceptable.
	Atlantic	1988	42.6	40.2	1.086	-
	Coastal Chip	1988	43.7	40.4	1.081	-
	Katahdin	1987	52.8	47.1	1.073	-
	Coastal Chip	1987	53.0	49.9	1.082	55 Chipped mid-January out of 10 C, Agron M600 Colorimeter; readings >40 acceptable.

¹Data for New York 1987 trials from the National Potato Germplasm Evaluation and Enhancement Report. All other data obtained from the NE-107 Regional Trials, as reported in Maine Agricultural Experiment Station Miscellaneous Publications 697, 704 and 708.

²Various color charts were used at the different locations; however, 1=lightest for all charts. Acceptable color ranges given for each location.

TABLE 1. — *continued*

Location ¹	Variety	Year	Total Marketable		Specific Gravity	Chip Color	Chip Comments ²
			Yield T/ha	Yield T/ha			
Pennsylvania							
	Atlantic	1989	36.1	33.1	1.100	1.0	1-2 acceptable.
	Coastal Chip	1989	33.5	29.8	1.086	1.5	
	Atlantic	1988	34.2	32.1	1.079	2.0	1-2 acceptable.
	Coastal Chip	1988	36.9	33.5	1.070	2.5	
	Atlantic	1987	47.2	44.1	1.085	1.2	1-2 acceptable.
	Coastal Chip	1987	47.1	43.5	1.078	1.5	
New Jersey	Atlantic	1989	29.9	25.6	1.082	3.8	Chipped 6,12 DAH, respectively.
	Coastal Chip	1989	34.7	30.9	1.070	4.6	1-6 acceptable.
(98 days)							
	Atlantic	1989	44.2	39.8	1.073	7,8,8	Chipped 3,6,13 DAH, respectively.
	Coastal Chip	1989	49.7	45.7	1.072	3,4,4	1-6 acceptable.
(138 days)							
	Atlantic	1988	54.4	49.4	1.075	3	Chipped 7 DAH.
	Coastal Chip	1988	58.4	54.1	1.067	2	1-6 acceptable.
(118 days)							

¹Data for New York 1987 trials from the National Potato Germplasm Evaluation and Enhancement Report. All other data obtained from the NE-107 Regional Trials, as reported in Maine Agricultural Experiment Station Miscellaneous Publications 697, 704 and 708.

²Various color charts were used at the different locations; however, 1 = lightest for all charts. Acceptable color ranges given for each location.

TABLE 1.— *continued*

Location ¹	Variety	Total Marketable Yield		Specific Gravity	Chip Color		Chip Comments ²
		Year	T/ha		Yield T/ha	Color	
	Atlantic	1988	62.0	1.076	57.6	3, 6, 7	Chipped 2, 5, 8 DAH, respectively.
	Coastal Chip (137 days)	1988	64.7	1.072	59.8	2, 5, 6	1-6 acceptable.
	Atlantic	1987	43.2	1.078	39.5	1, 8, 8	Chipped 2, 4, 10 DAH, respectively.
	Coastal Chip	1987	50.0	1.070	46.8	4, 6, 7	1-6 acceptable
Maine	Atlantic	1989	41.6	1.086	34.1	6, 6	Chipped early December out of 10 C.
	Coastal Chip	1989	43.1	1.081	34.7	4, 7	1-7 acceptable.
	Atlantic	1988	38.8	1.089	36.1	6, 4	Chipped early December out of 10 C.
	Coastal Chip	1988	39.0	1.084	34.7	5, 6	1-7 acceptable.
	Atlantic	1987	36.8	1.106	32.9	5, 5	Chipped early December out of 10 C.
	Coastal Chip	1987	32.6	1.102	28.8	5, 7	1-7 acceptable.
North Carolina	Atlantic	1988	43.2	1.091	36.2	5	1-4 acceptable.
	Coastal Chip	1988	42.4	-	35.7	2	
	Atlantic	1987	29.0	-	23.4	-	
	Coastal Chip	1987	36.8	-	30.3	-	

¹Data for New York 1987 trials from the National Potato Germplasm Evaluation and Enhancement Report. All other data obtained from the NE-107 Regional Trials, as reported in Maine Agricultural Experiment Station Miscellaneous Publications 697, 704 and 708.

²Various color charts were used at the different locations; however, 1 = lightest for all charts. Acceptable color ranges given for each location.

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